Jefferson County Shoreline Master Program Update

Multi-scale Analysis for Restoration Planning

Ecology – SMP Grantees Fall Coordination Meeting

October 25, 2006   Mountaineers Building, Seattle

Project Partners & Co-Presenters

Jefferson County Department of Community Development

- Michelle McConnell, Project Coordinator
- Josh Peters, Senior Planner

ESA Adolfson

- Margaret Clancy, Project Lead

Battelle Marine Sciences Laboratory

- Heida Diefenderfer, Project Lead

WA Department of Ecology

- Stephen Stanley
- Susan Grigsby

Jefferson County SMP: An Update in Progress

Project History

- 1989 SMP
  - Currently on the books
- 2000 Draft SMP (CZM $)
  - Tala to Kala shoreline study
  - Never adopted
- 2003 – 2005 Shoreline Inventory (CZM $)
- 2005 – 2007 Comprehensive Update
- WAC = 2011 Update

Jefferson County, WA: Nearly 600 miles of shoreline under SMP jurisdiction
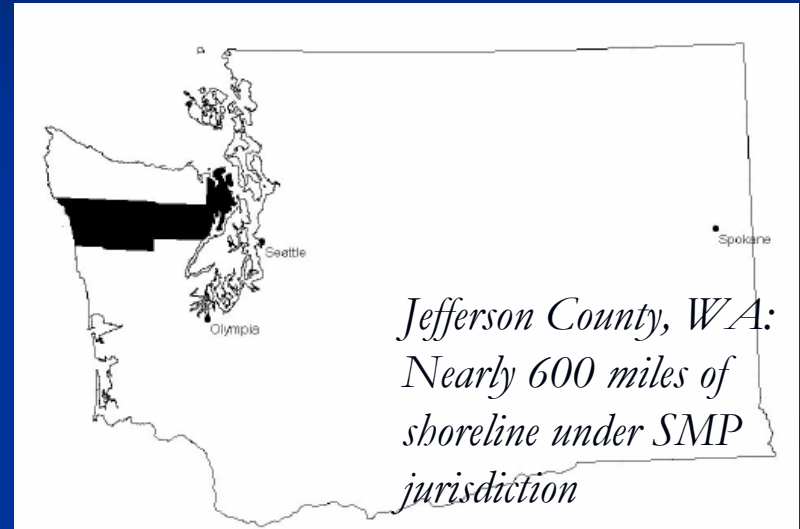
Forming a Restoration Planning Partnership for Multi-Scale Analysis

Collaboration by Design

- Jefferson County
- ESA Adolfson
- Battelle Marine Science Laboratory
- Ecology

Restoration Planning for SMP Updates

Margaret Clancy, ESA Adolfson

Restoration Prioritization for Local and Regional Shoreline Master Programs: A Case Study from Jefferson County, Washington

Heida L. Diefenderfer, Ron M. Thom,

Kathryn L. Sobocinski, Chris W. May, Susan L. Southard,

Amy B. Borde, Chaeli Judd, John Vavrinec III

Battelle Marine Sciences Laboratory

Sequim, Washington

Purpose

Master programs shall also include policies that promote restoration of ecological functions, as provided in WAC <u>173-26-201</u> (2)(f), where such functions are found to have been impaired based on analysis described in WAC <u>173-26-201</u> (3)(d)(i).

-WAC 173-26-201(2)(c)

Specifically:

- Identify degraded areas, impaired ecological functions, and sites with potential for restoration;

- Establish overall goals and priorities for restoration of degraded areas and impaired ecological functions.

-Chapter 173-26 WAC, shoreline management guidelines
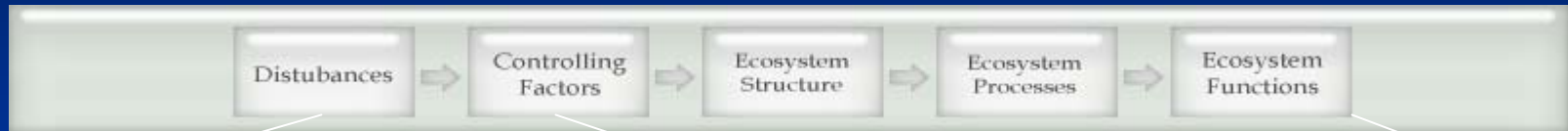
Definitions: Available Strategies

- <u>Creation</u> **– bringing into being a new ecosystem that previously did not exist on the site**

- <u>Enhancement</u> **– any improvement of a structural or functional attribute**

- <u>Restoration</u> **– return of an ecosystem to a close approximation of its previously existing condition**

- <u>Conservation</u> **– maintenance of biodiversity**

- <u>Protection</u> **– exclusion of activities that may negatively affect the system**

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Overview and Principles of Approach

- Uses a *conceptual model* that provides a scientifically defensible framework
- Uses ecologically relevant *spatial scales*
- Considers *hydrologic context*
- Focuses on *existing quantitative GIS data* (state, tribal, and local county sources)
- Uses *simple scoring*; minimum interpretation = maximum consistency
- Scoring is guided by *quantitative data*: Critical parameter values are derived from literature or percentile distributions of data
- The probability of success of a project, and appropriate strategies, are dependent on the *level of disturbance* at site and landscape scales

Simple Conceptual Model for Jefferson County Shorelines

Distubances ⇒ Controlling Factors ⇒ Ecosystem Structure ⇒ Ecosystem Processes ⇒ Ecosystem Functions

Stressors
•Roads
•Fish Barriers
•Armoring
•Land Use
•High Risk Septic
•Marinas
•Shoreline Modifications (launch ramps, docks, stairs, jetties)
•Aquaculture
•Shellfish closure
•Fill
•Dredge
•Diking

Controlling Factors
•Wave Energy/Disturbance
•Light
•Substrate
•Sediment Supply
•Depth/Slope
•Hydrology
•Water Properties

Ecological Functions
•Forage Fish Spawning
•Geoducks
•Rare Plants
•Wetlands
•Eelgrass, Algae

Analysis at Multiple Scales

- **Watershed –** Based on Washington State Department of Ecology, Stanley et al., 2006

- **Drift Cell Reach –** Delineated by Jim Johannessen for Adolfson Assoc., Inc., 2006

- **ShoreZone Unit –** ShoreZone, Washington Department of Natural Resources, 2001

Scales
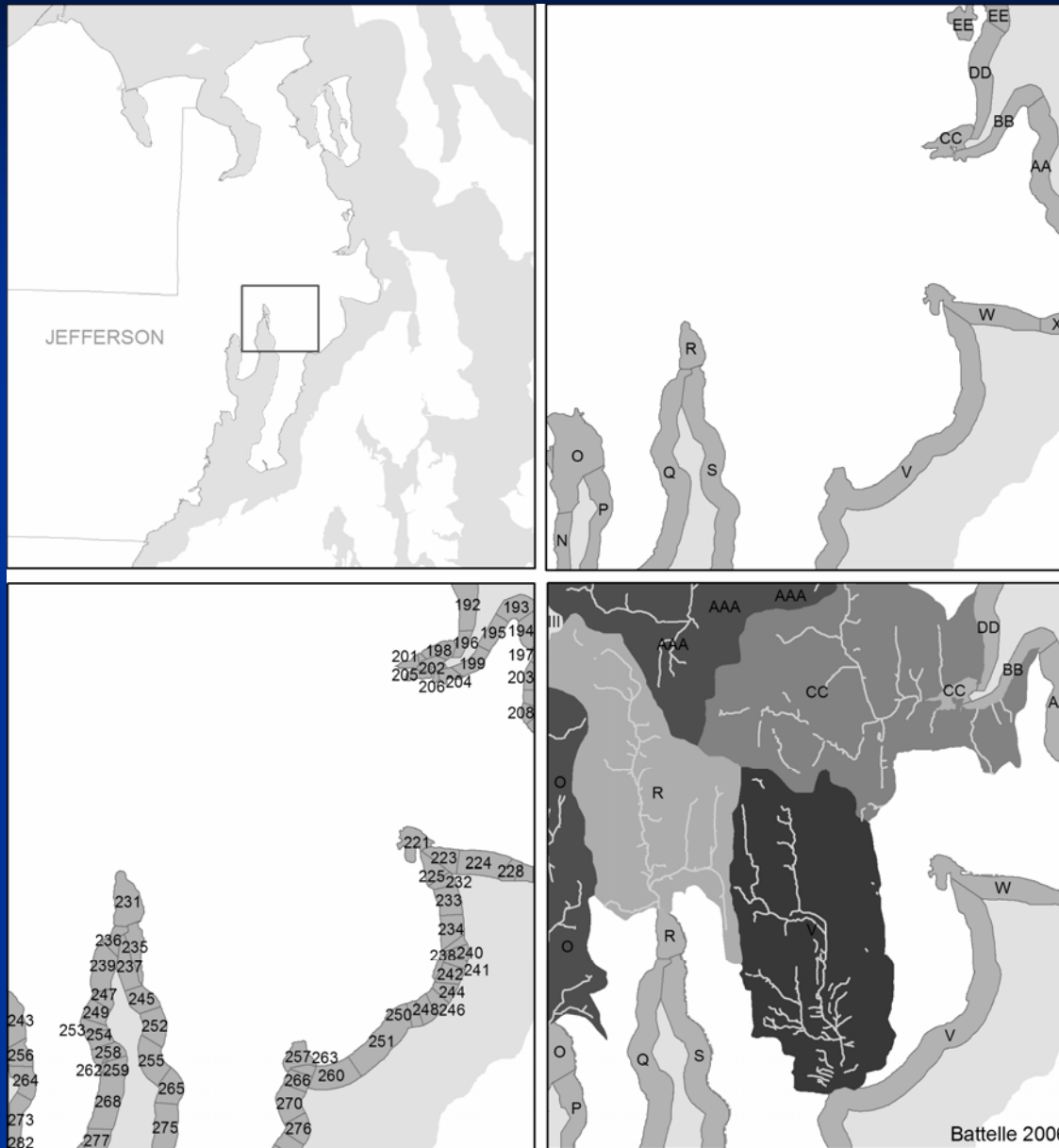
Geomorphic Classification of Jefferson County Shorelines

- Low Bank
- High Bluff
- Barrier
- Lagoon
- Rocky Shore
- River (Estuarine) Deltas
- Embayments

cf. Shipman, H. 2004. Developing a geomorphic typology for the Puget Sound shoreline. Discussion paper (draft). Washington State Department of Ecology/PSNERP Nearshore Science Team, 2004.

Stressor Scoring Example

Stressor	Data Source	Data Processing Description	Scoring	Raw Data Summary			Notes
				Mean	Min	Max	
Roads	DNR and Jefferson County	The roads layer is a combination of two roads data sets that encompassed paved and non-paved roads in Jefferson County	Length of road per upland area of SZU	.0018	0	.0175	Normalized score 0-5
Docks	Point No Point Treaty Council	GIS layer describing shoreline modifications	Feature per reach	0.39	0	26	Counted number of docks/piers; normalized score 0-5.

Functions Scoring Example

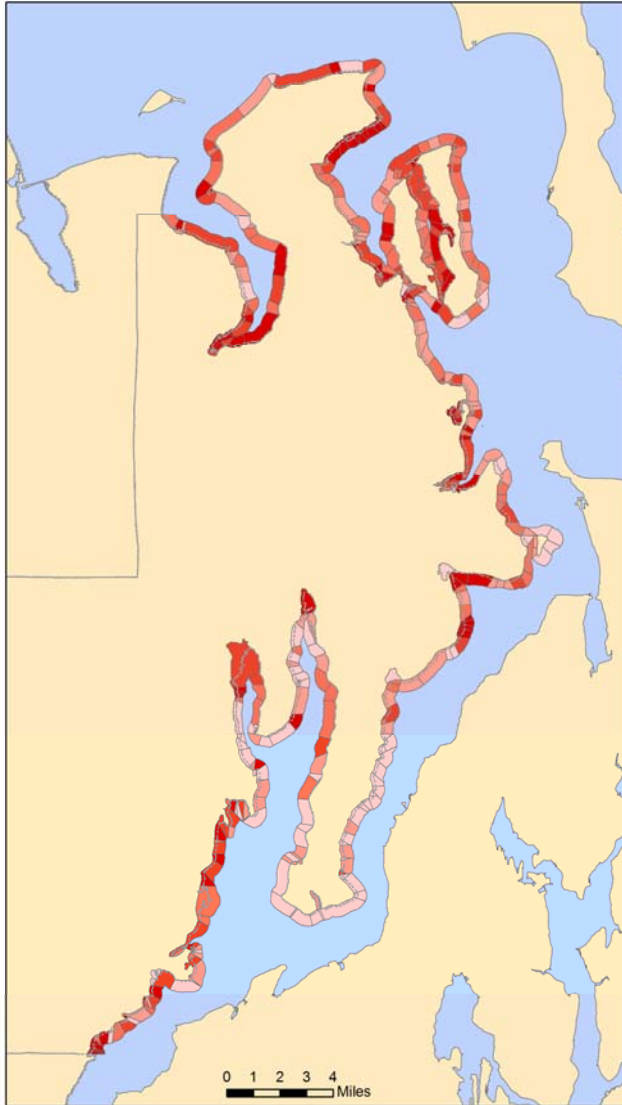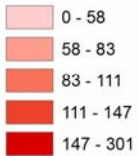|	Scores		
	1	3	5
Herring Spawning, Herring Holding, Surf Smelt Spawning, Sand lance Spawning, Geoducks	If not present	N/A	If present
Rare Plants, Wetlands	If not present	If present	N/A
Eelgrass, Bull Kelp, Intertidal Macroalgae	If not present	If patchy	If continuous

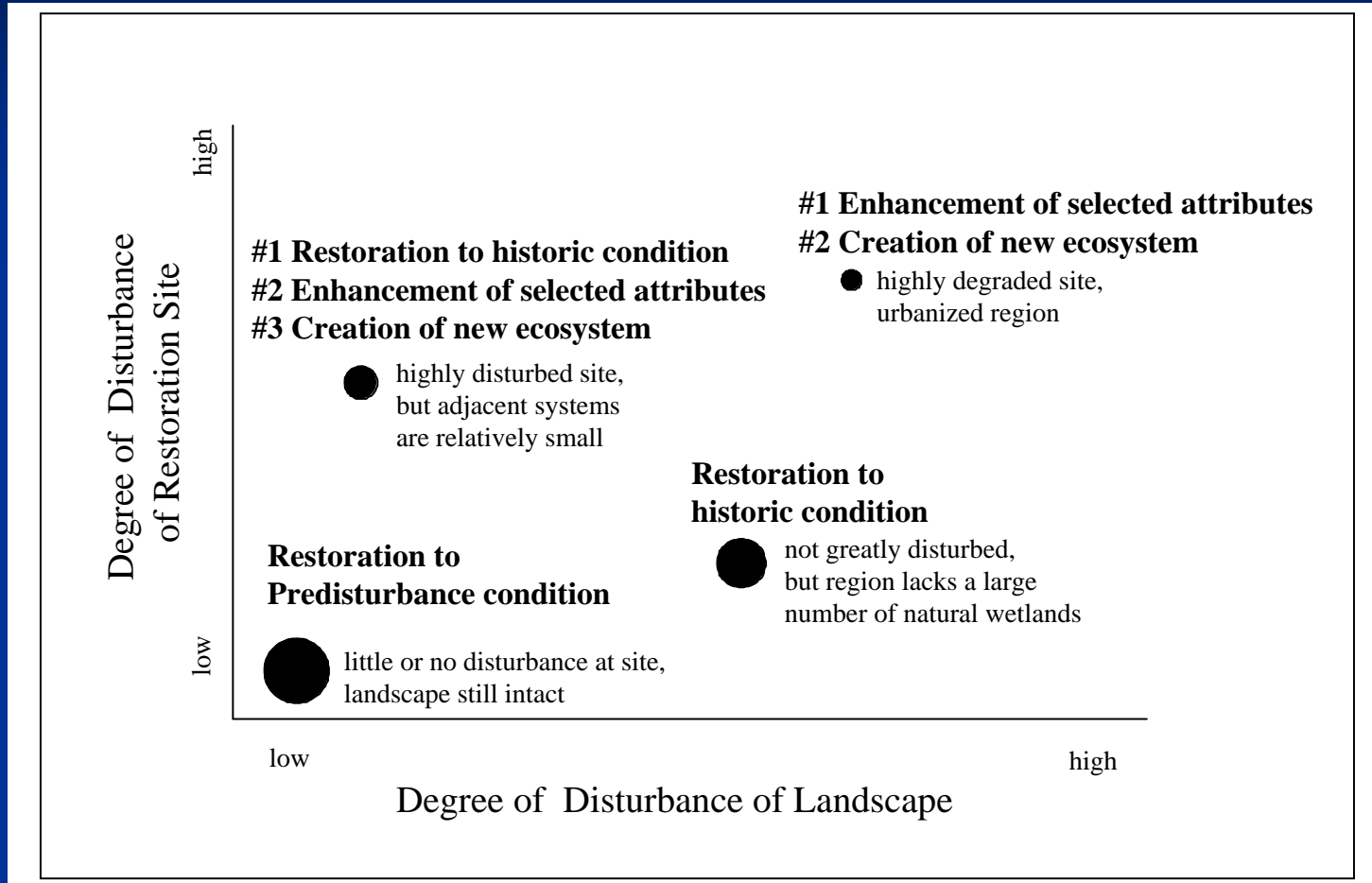# Jefferson County Scoring
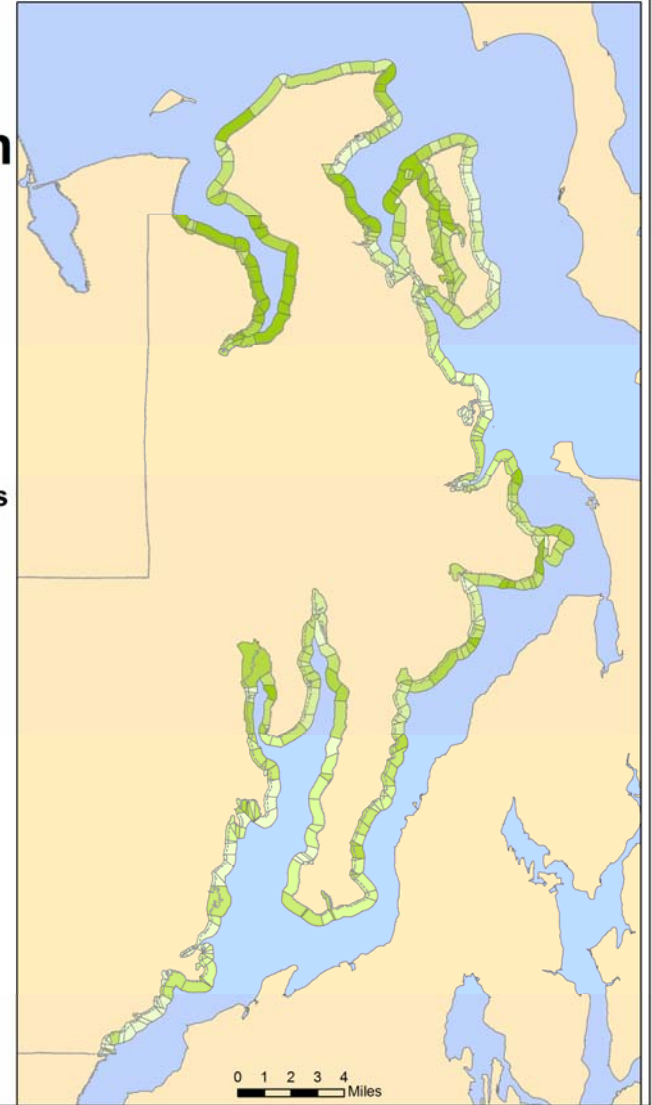
Elements of the Watershed Condition Index

1) hydro-road intersections;

2) riparian score, includes elements such as bank erosion and riparian vegetation

3) hydrological alterations score, e.g. alterations to delivery, movement, and loss of water (Stanley et al. 2005, 2006);

4) percent forest cover;

5) road density.

Basis of Prioritization in Ecological Theory

The y-axis is labeled "Degree of Disturbance of Restoration Site" (ranging from low to high). The x-axis is labeled "Degree of Disturbance of Landscape" (ranging from low to high).

#1 Restoration to historic condition
#2 Enhancement of selected attributes
#3 Creation of new ecosystem
- highly disturbed site, but adjacent systems are relatively small

#1 Enhancement of selected attributes
#2 Creation of new ecosystem
- highly degraded site, urbanized region

Restoration to Predisturbance condition
- little or no disturbance at site, landscape still intact

Restoration to historic condition
- not greatly disturbed, but region lacks a large number of natural wetlands

• Shreffler & Thom, 1993. Report to Washington DNR, Olympia, WA.
• Thom et al., 2005. *Restoration Ecology* 13(1):193-203.
• cf. National Research Council, 1992. *Restoring Aquatic Ecosystems.*

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Application to Shoreline Restoration Planning

	Low Management Area Disturbance	Moderate Management Area Disturbance	High Management Area Disturbance
High Site Disturbance	**A** Restore Enhance Create	**B** Enhance Create Restore	**C** Enhance Create
Moderate Site Disturbance	**D** Enhance Restore Preserve	**E** Conserve Enhance Create Restore	**F** Enhance Create Restore
Low Site Disturbance	**G** Conserve Preserve	**H** Conserve Enhance Restore	**I** Enhance

# Example Division of Sites by Management Strategy
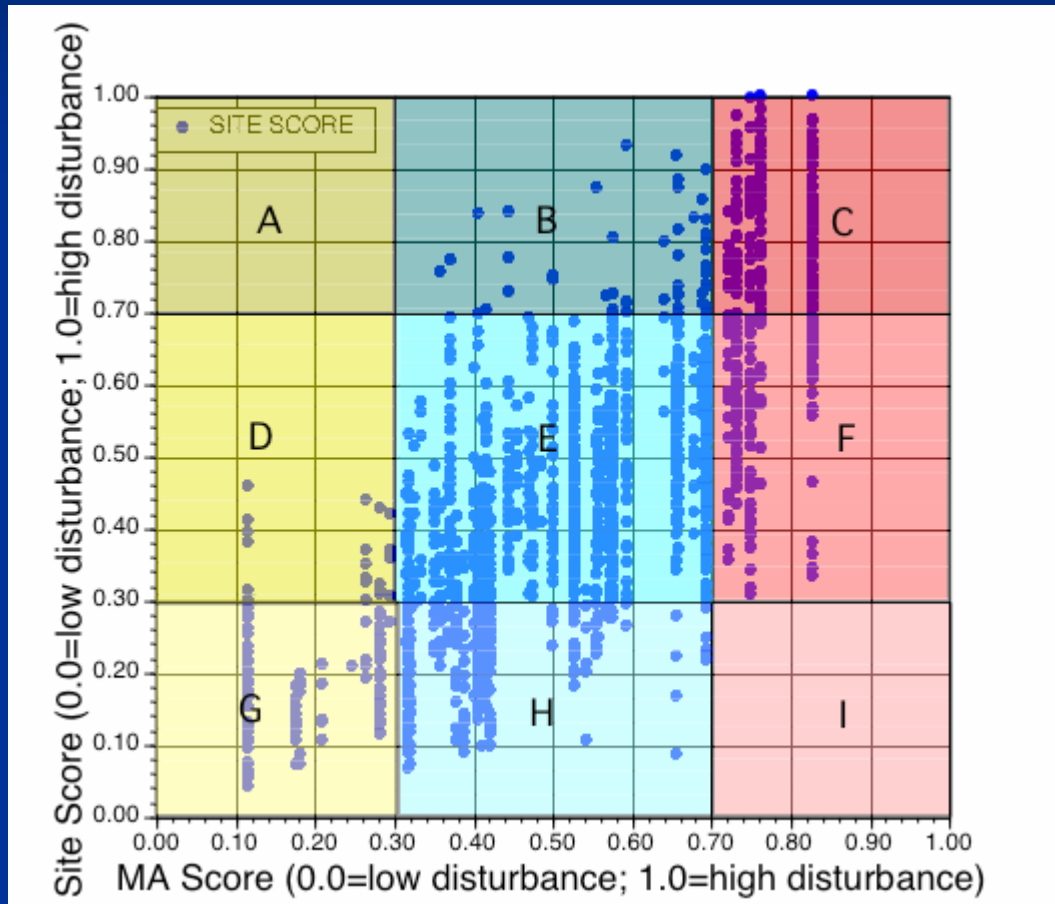
Summary of Approach

- **Controlling factors approach – science-based, defensible**

- **Based on current, ground-truthed field data and widely available sources**

- **Allows scale-able analyses, which may be combined for regional landscape analysis**

- **Provides prioritization framework**

- **Interpretation of individual metric scores enables identification of problem areas**

Characterizing Watershed Processes for Freshwater Ecosystems

Stephen Stanley, Dept. of Ecology
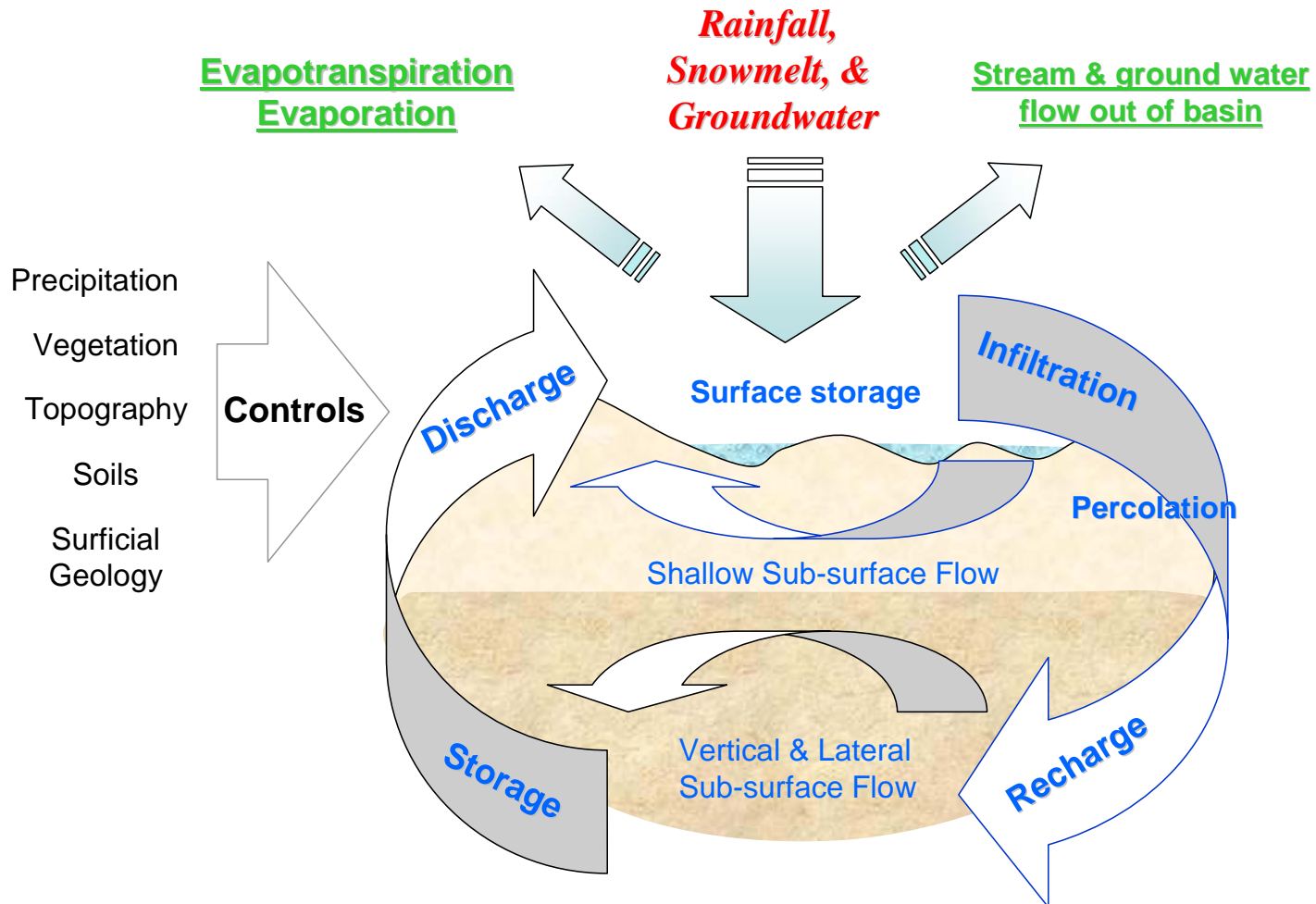
Describe Components, Controls & Key Areas

Table B-1: Major controls and key areas for the delivery, movement, and loss of water in the Puget Sound region.

Component of Process			Major Natural Controls	Key Areas
Delivery			Precipitation patterns	**Recharge areas with higher amounts of precipitation**
			Timing of snowmelt	**Rain-on-snow zones Snow-dominated zones**
Movement	At the surface	Overland flow	Precipitation patterns Soils	Saturated areas
		Surface storage	Topography Surficial geology Soils	**Areas of low gradient Floodplains**
	Below surface	Shallow subsurface flow	Topography Surficial geology	**Areas on geologic deposits with low permeability**
		Recharge		**Areas on geologic deposits with high permeability**
		Vertical and lateral subsurface flow		Entire watershed
		Subsurface storage	Surficial geology	Deep permeable geologic deposits

Models for Scoring

Importance of a sub-basin in the hydrologic process =

Importance of sub-basin for surface water + importance sub-basin for groundwater + importance of sub-basin in evapotranspiration

Model 1 = (Precipitation + Timing of Water Delivery + Surface Storage) + (Precipitation + Recharge + Discharge)] + (Evapotranspiration)

Model 1 =
CH1*[W1* [P1 + (HU1 + HU2 + HU3 + HU4 + HU5 + HU6)] +
CH2*[WH2 * [P1 + (HU7 + HU8 + HU9 + HU10)]]

Models for Scoring Important Areas

Hydrologic Process	Component of process being modeled	Element of Process	Variable
Surface Water			
	Delivery	Precip Patterns	P_1 rating of amount of precipitation in sub-basin relative to average precipitation in watershed
	Delivery	Timing of Water delivery	HU_1 rating for area of snow dominated zone HU_2 rating for area of rain on snow zone
	Movement	Surface Storage	HU_3 rating for area of depressional wetlands
		Surface Storage	HU_4 rating for unconfined floodplain HU_5 rating for moderately confined floodplain HU_6 rating for confined floodplain

Models for Scoring Important Areas

Variable	Data Layers for GIS
Surface Water	
P_1 rating of amount of precipitation in sub-basin relative to average precipitation in watershed	**Precipitation**
HU_1 rating for area of snow dominated zone HU_2 rating for area of rain on snow zone	**Rain-on-snow**
HU_3 rating for area of depressional wetlands (<2% includes riverine depressional)	**Wetlands** **Hydric soils** **SSHIAP confinement data** **SSHIAP confinement data**
HU_4 rating for unconfined floodplain HU_5 rating for moderately confined floodplain HU_6 rating for confined floodplain	
Groundwater	
P_1 rating of amount of precipitation in sub-basin relative to average precipitation in watershed	**Precipitation**
HU_7 rating for areas of high permeability	**Geology**
HU_8 rating for high perm deposit adjoining unconfined floodplain HU_9 rating for high perm deposit adjoining moderately confined floodplain HU_{10} rating high perm deposit adjoining confined floodplain	**Geology and SSHIAP confinement data**

Models for Scoring Alterations

| Hydrologic Process	Component of process being modeled	Element of Process	Variable
Surface Water			
	Delivery	Timing of Water delivery	HA_1 rating of loss of forest in snow dominated zone HA_2 rating of loss of forest in rain on snow zone HA_3 rating of loss of forest in rain dominated areas HA_4 rating of impervious surface in sub-basin
	Movement	Surface Storage (loss of wetlands/ floodplains)	HA_5 rating of wetland alteration, urban HA_6 rating of wetland alteration, rural/agriculture
			HA_7 rating of floodplain loss unconfined floodplain HA_8 rating of floodplain loss mod. conf. floodplain HA_9 rating of floodplain loss confined floodplain

Models for Scoring Alterations

Variable	Data Layers for GIS
Surface Water	
HA_1 loss of forest in snow dominated zone HA_2 loss of forest in rain on snow zone HA_3 loss of forest in rain dominated areas HA_4 effective impervious surface in sub-basin	**Precipitation zones** **Land use**
HA_5 wetland alteration, urban HA_6 wetland alteration, rural/agriculture	**Wetlands** **Land use**
HA_7 floodplain loss unconfined floodplain HA_8 floodplain loss mod. conf. floodplain HA_9 floodplain loss confined floodplain	**Land use** **SSHIAP confinement data**
Groundwater	
HA_{10} impervious cover on low perm deposits HA_{11} impervious cover on high perm deposits HA_{12} loss of forest on low perm deposits HA_{13} loss of forest on high perm deposits	**Geology** **Land use**
HA_{14} loss of forest adjacent to unconfined floodplains HA_{15} loss of forest adjacent to moderately confined floodplains HA_{16} loss of forest adjacent to confined floodplain	**Land use** **SSHIAP confinement data**
Evapotranspiration	
HA_{17} relative amount of impervious surface in sub- basin	**Land use**

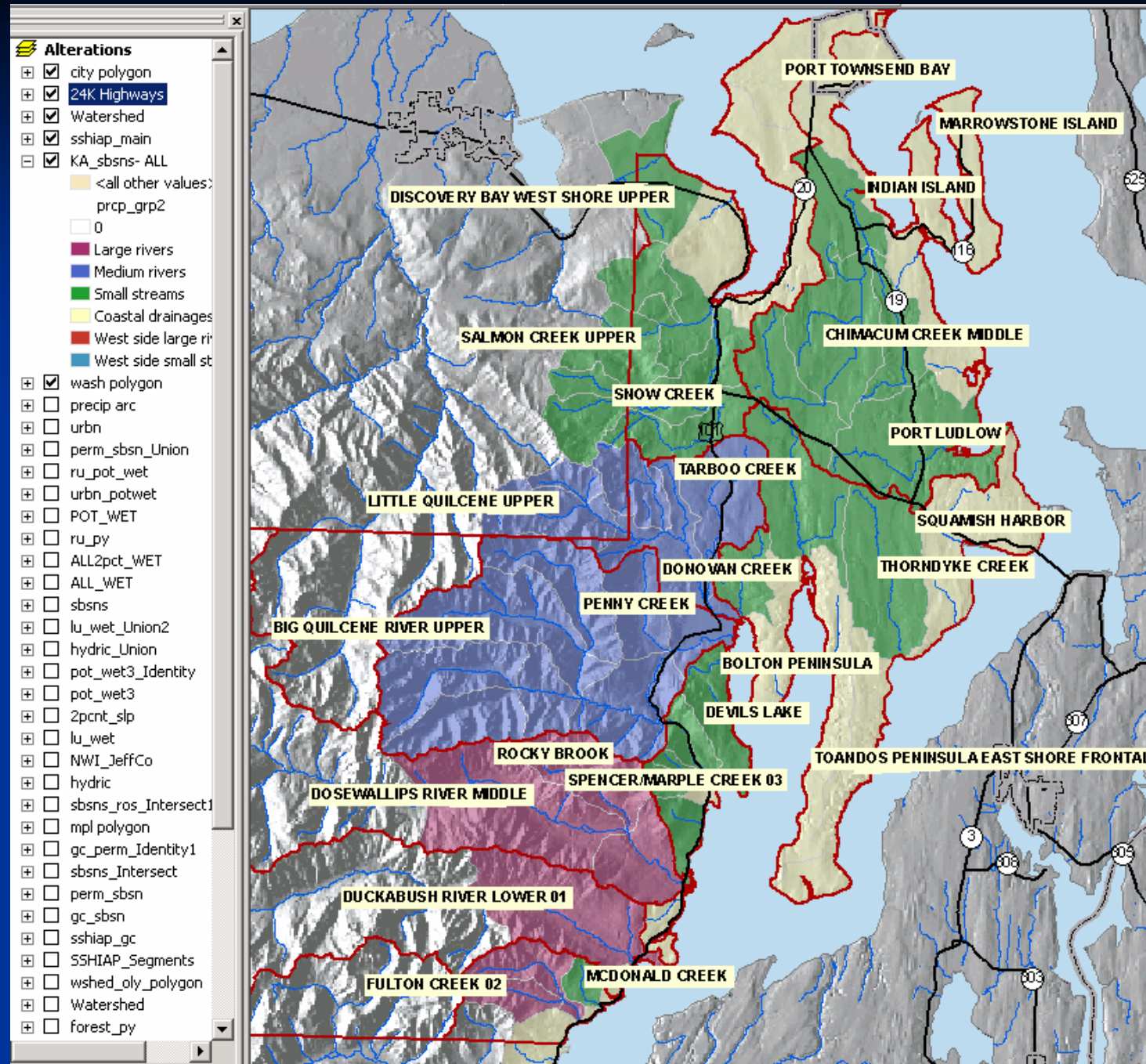# Example of Scoring for Jefferson County

Water Flow Processes

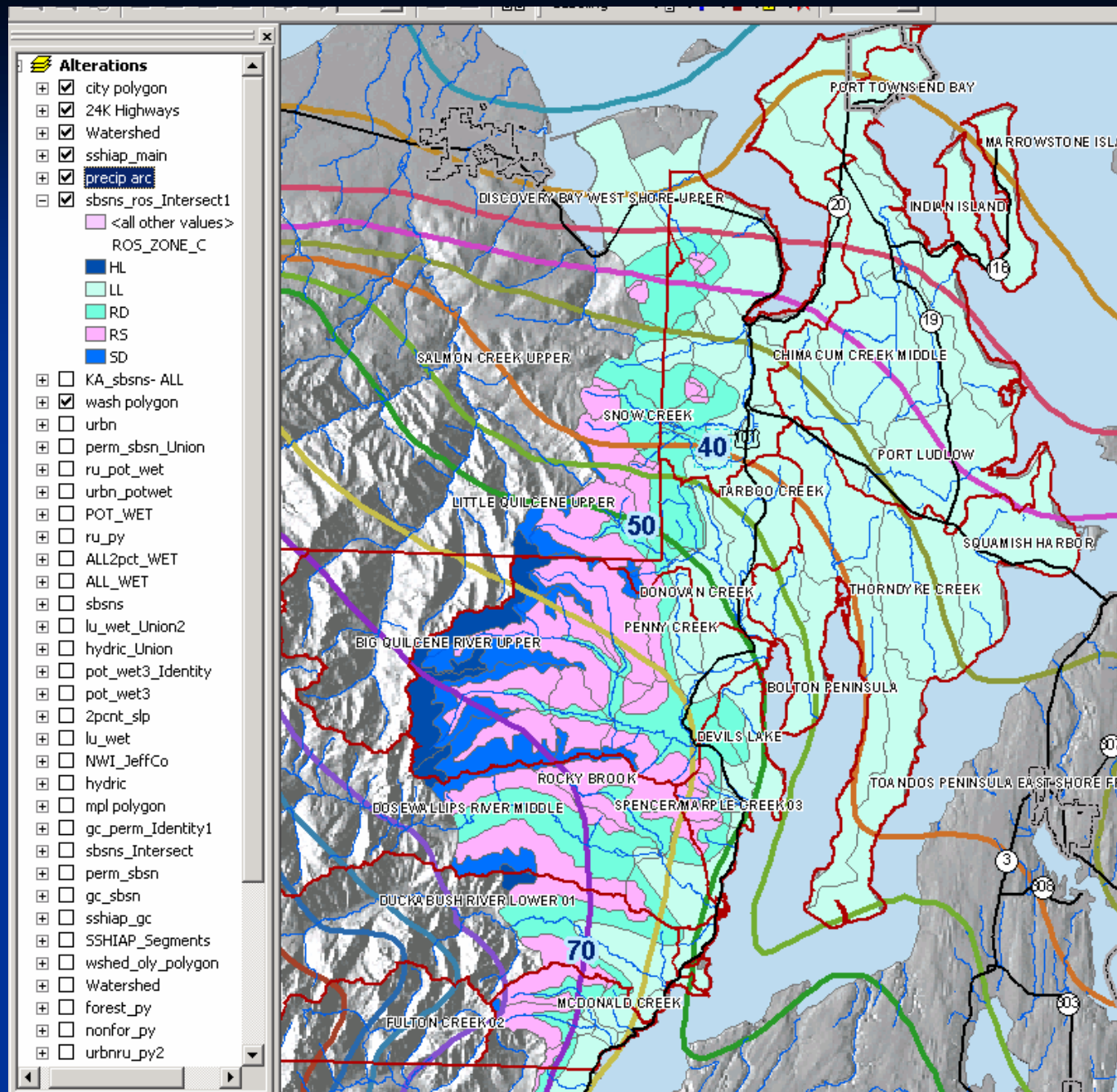# Jefferson County - Watershed Analysis Units First Draft
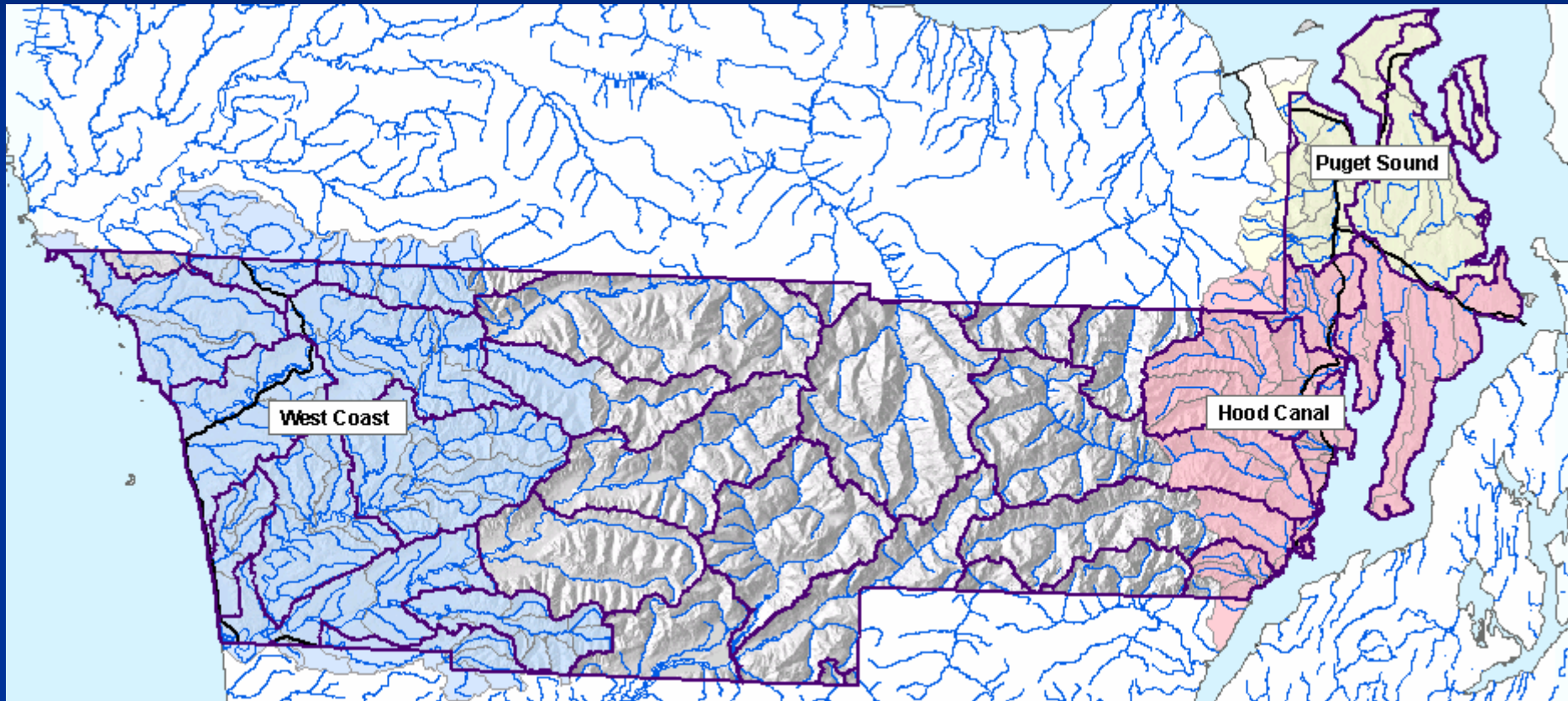
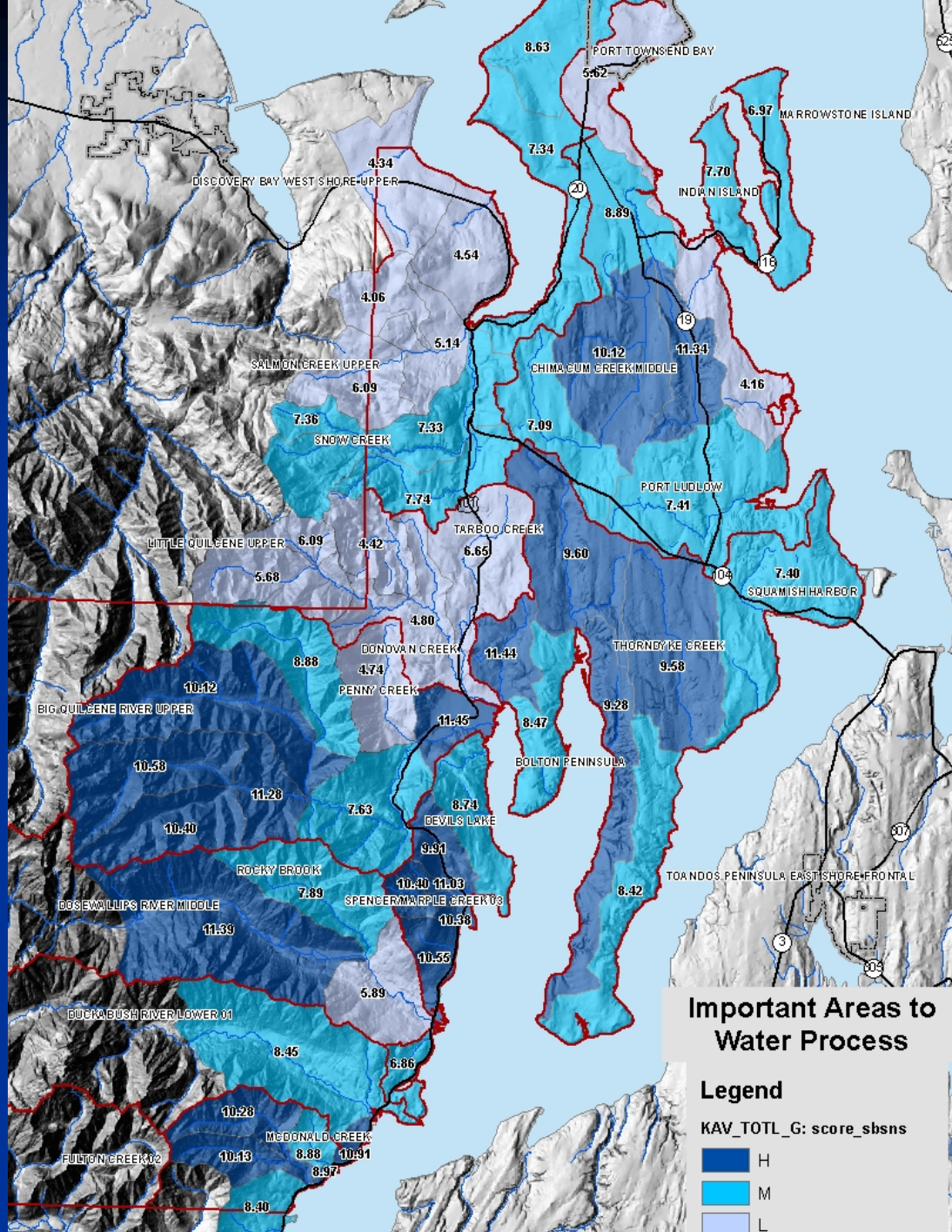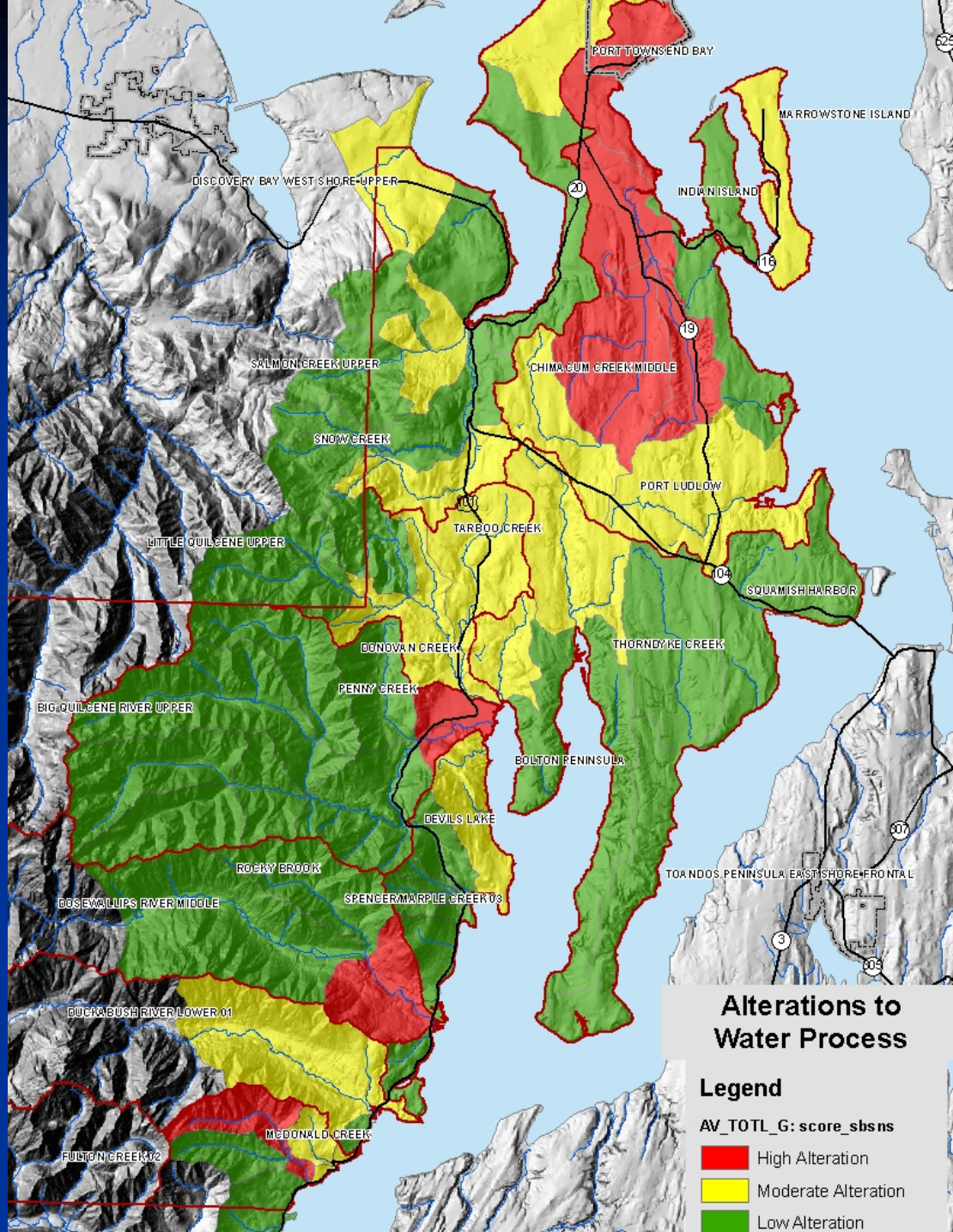Jefferson County

Final Watershed Analysis Units

Jefferson County

Precipitation Types

Jefferson County - Important Areas (unaltered conditions)

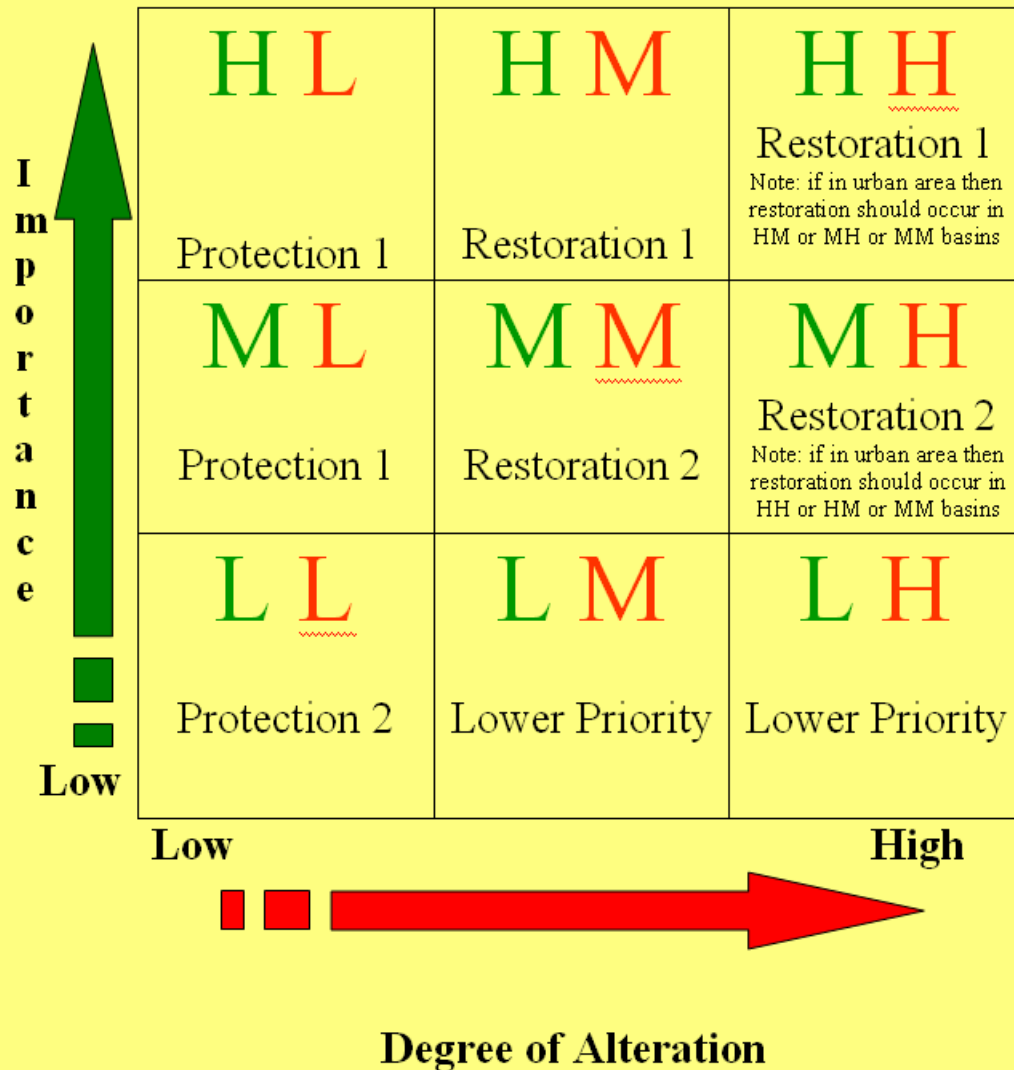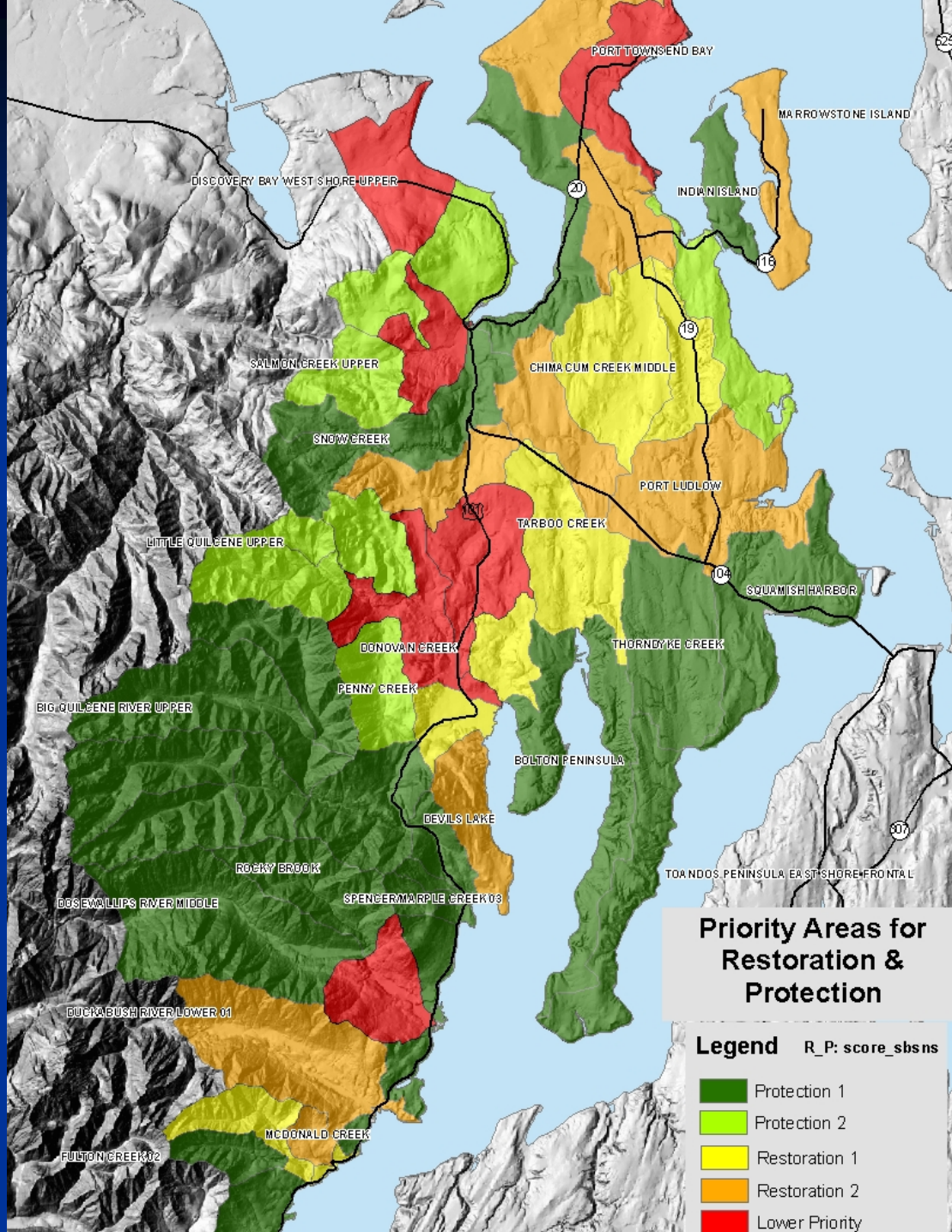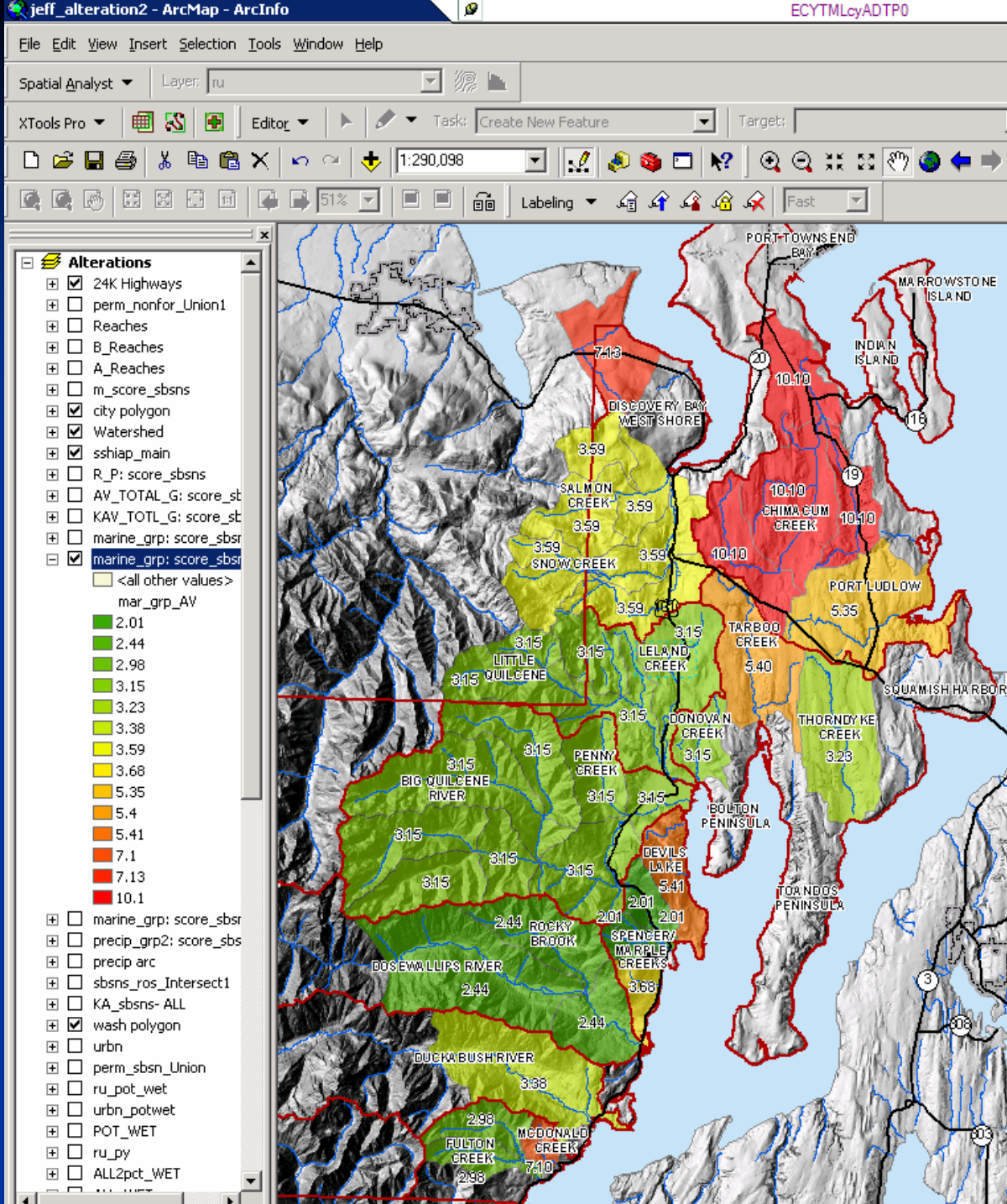**Jefferson County –** *Alterations to Important Areas*

Figure 5 – Analysis Matrix. The "Green" letters represent the relative degree of importance of a process for an analysis area (from Figure 3 maps).
The "Red" letters represent the relative level of alteration for the analysis area (from Figure 4 maps).
The combination of these different levels of importance and alteration for a process establish the areas for protection and restoration (Figure 6)

Jefferson County

Final Alteration Scores by Analysis Unit

Jefferson County

Final Areas for Restoration and Protection

Priority Areas for Restoration & Protection

Legend R_P: score_sbsns

- Protection 1
- Protection 2
- Restoration 1
- Restoration 2
- Lower Priority

Jefferson County

Final Alteration Scores by Analysis Unit